



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials science and elements of chemistry [S1Log2>NoMiEC]

### Course

Field of study  
Logistics

Year/Semester  
2/4

Area of study (specialization)  
–

Profile of study  
general academic

Level of study  
first-cycle

Course offered in  
polish

Form of study  
full-time

Requirements  
compulsory

### Number of hours

Lecture  
30

Laboratory classes  
15

Other (e.g. online)  
0

Tutorials  
0

Projects/seminars  
0

### Number of credit points

4,00

### Coordinators

dr hab. inż. Andrzej Miklaszewski prof. PP  
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### Lecturers

### Prerequisites

The student should have a basic knowledge of physics and chemistry as also material strength. The student should be able to obtain information from specified sources and be willing to cooperate as part of a team.

### Course objective

To provide the students a basic knowledge in the field of materials science, including: Classification and characterization of materials: metals, polymers, ceramics, composites. Other categories of classification of materials: structural, functional, ecomaterials, biomaterials. Structure of the materials in the macro, micro and nano scale. Bonds in the crystal structure. Defects of crystalline materials. The most important material properties: physical, chemical, mechanical, technological. Basic methods for measuring the properties of materials. Fundamentals of thermodynamics and diffusion in materials. Phase equilibria of metal alloys, definition of phases and solutions. Mechanism of crystallization. Characteristics of phase transformations and their classification. The methods of shaping the material properties.

### Course-related learning outcomes

Knowledge:

1. Knows the basic issues of chemical changes, materials science and strength of materials and their importance for industrial and logistics processes [P6S\_WG\_03]

Skills:

1. Is able to apply the proper knowledge as well as experimental and measuring techniques to solve the problem within the studied subject [P6S\_UW\_03]

2. Is able to identify changes in requirements, standards, regulations, technical progress and the reality of the labor market, and based on them determine the needs of supplementing knowledge [P6S\_UU\_01]

Social competences:

1. Is aware of initiating activities related to the formulation and transfer of information and cooperation in society in the field of logistics [P6S\_KO\_02]

Is aware of cooperation and work in a group on solving problems within logistics and supply chain management

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Knowledge acquired during the lecture is verified by two 45-minute colloquia carried out during the 14th and 15th lectures. Each test consists of 10-20 questions (test and open), variously scored.

Passing threshold: 50% of points. Final issues on the basis of which questions are developed are presented in lectures and discussed in detail during their duration.

Laboratory: Skills acquired as part of the laboratory classes are checked on an ongoing basis during each class in the form of an oral or written answer to the questions asked and assessed on the basis of reports from each laboratory exercise. Each laboratory exercise requires a positive evaluation. At the end of the semester, after completing 5 compulsory exercises, there is a possibility to pass a corrective exam of selected exercises.

### Programme content

Lecture: Classification and characterization of materials: metals, polymers, ceramics, composites. Other categories of classification of materials: structural, functional, ecomaterials, biomaterials. Structure of the materials in the macro, micro and nano scale. Bonds in the crystal structure. Defects of crystalline materials. The most important material properties: physical, chemical, mechanical, technological. Basic methods for measuring the properties of materials. Fundamentals of thermodynamics and diffusion in materials. Phase equilibria of metal alloys the definition of phases and solutions. Mechanism of crystallization. Characteristics of phase transformations and their classification. The methods of shaping the material properties.

Laboratory: Steels. Heat treatment of steels. Structure and properties of steel after chemical heat treatment. Tool steels. Cast iron alloys. Copper alloys. Aluminium alloys. Surface layers with special properties. Composite materials. Causes of premature wear of machine parts and tools.

### Teaching methods

Lecture: multimedia presentation

Laboratory: microscopic observations; performance of tasks given by the teacher - practical exercises.

### Bibliography

Basic:

1. Blicharski M. Wstęp do inżynierii materiałowej. WNT, Warszawa, 2003.

2. Przybyłowicz K. Metaloznawstwo, WNT, Warszawa, 2007.

3. Dobrzański L. Podstawy nauki o materiałach i metaloznawstwo. WTN, Warszawa, 2002

Additional:

1. Materiały inżynierskie tom. 1 i 2, Ashby M.F., Jones D.R.H., WNT, 2004.

2. Współczesne materiały konstrukcyjne i narzędziowe, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1996

3. Wybrane metalowe materiały konstrukcyjne ogólnego przeznaczenia, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1997

4. Strukturalne aspekty własności mechanicznych wybranych materiałów, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1998
5. Współczesne materiały konstrukcyjne i narzędziowe, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1996
6. Wybrane metalowe materiały konstrukcyjne ogólnego przeznaczenia, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1997
7. Strukturalne aspekty własności mechanicznych wybranych materiałów, Leda H. , Wydawnictwo Politechniki Poznańskiej, Poznań, 1998

### Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 100   | 4,00 |
| Classes requiring direct contact with the teacher   | 45    | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 55    | 2,00 |